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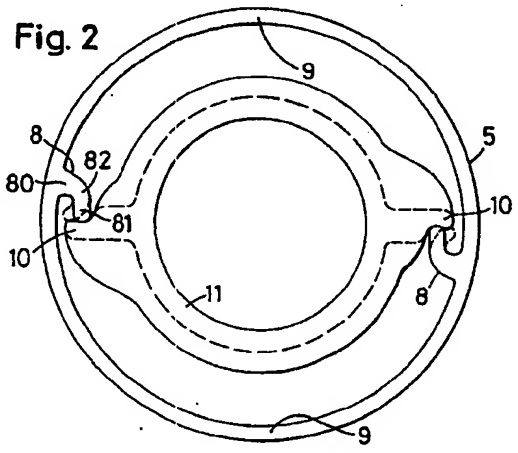
(54) Safety Closure.

(57) A safety closure for a container comprises a cap having a screw-thread for threaded connection with the neck (11) of a container, and at least one internal fin (8) on the skirt (5) of the cap engaging a projection (10) on the container neck when the cap is turned in the unscrewing direction to prevent unscrewing until the skirt of the cap is deformed to place the fin (8) clear of the projection (10), wherein the fin (8) has a base portion (80) integrally formed with the skirt (5) and extending substantially radially of the skirt and an outer portion (81) for contact with the projection on the container, the fin (8) being capable of flexing about an elbow (82) intermediate the base (80) and outer (81) portions. When excessive force is used to unscrew the cap from the container, without firstly deforming the skirt of the container, the angled fin (8) deforms and rides over the abutment (10), so releasing the cap.

Fig. 2



EP 0 443 868 A1

This invention relates to safety closures and is especially concerned with a safety closure which requires a combined squeezing and turning operation to remove it from a container to which it is applied.

Many different types of safety closure, or child-resistant closure, have been proposed, amongst which is the type generally known as the "squeeze-and-turn" type. This has a threaded skirt for screw-threaded application to and removal from the neck of a container, and a deformable portion including one or more internal fins or lugs which co-operate with corresponding abutments on the container neck to resist the unscrewing operation necessary to remove the closure from the container until the deformable portion of the closure is deformed to place the fins or lugs clear of the abutments. A simple form of this type of safety closure is disclosed in United Kingdom Patent Specification No: 1521201, in which the closure is provided with a single skirt, the upper portion of the skirt being provided with a screw-thread for engagement with a screw-thread on the container neck; and the lower portion of the skirt being deformable and having internal lugs which engage a camming projecting on the container neck. When the closure is screwed fully onto the container neck, the lugs on the closure and the camming projection are in engagement and simple unscrewing of the closure is impossible. Removal of the closure can only be accomplished if the lugs are placed clear of the projections, and this is accomplished by deforming the lower part of the skirt of the closure by radial pressure applied at right angles to the position of the lugs and projections.

A double-skirted or double-walled variation of this type of safety closure is disclosed in United Kingdom Patent Specification No: 1387572. This shows a closure having an inner skirt, which is provided with a screw-thread for engagement with a screw-threaded container neck, and an outer skirt, which is deformable and has projections engaging with complementary recesses on the container neck. Other closures of this general type are disclosed for example in UK Patent Specifications Nos: 1434546, 1603294 and 2011869.

A problem which occurs with closures of the "squeeze-and-turn" variety stems from their misuse. As mentioned above, the correct way to remove the closure is to deform the lower part of the skirt, by radial pressure applied at right angles to the position of the fins and projections, followed by normal unscrewing. The deformation of the lower part of the skirt causes that part of the skirt to take up a substantially elliptical form, and the fins on the closure skirt are thus moved radially outwardly of the container neck and thus clear of the projections thereon. Often, however, attempts are made to remove the closure by a simple unscrewing motion only, and when this does not lead to the ready release of the closure excessive force is applied, the effect of which is to damage the interengaging projections on the closure and container neck. Indeed, in many instances the projections on the closure or container, or both, can be broken.

It is an object of the invention to overcome this disadvantage of the known "squeeze-and-turn" safety closures, and according to the invention a safety closure comprises a cap having a screw-thread for threaded connection with the neck of a container, and at least one internal fin on the skirt of the cap engaging a projection on the container neck when the cap is turned in the unscrewing direction to prevent unscrewing until the skirt of the cap is deformed to place the said fin clear of the said projection, characterised in that the fin has a base portion integrally formed with the skirt and extending substantially radially of the skirt and an outer portion for contact with the projection on the container, the fin being capable of flexing about an elbow intermediate the base and outer portions.

The closure is intended to be used in precisely the same way as the known "squeeze-and-turn" closures. Thus, in normal application of the cap to a container it is screwed on in the normal way and the fins on the skirt of the cap ride over the projections on the container and "snap" back behind them. In order to remove the cap it is first necessary to squeeze the skirt at right angles to the fins, thus forming the cap into an elliptical shape and placing the fins radially outwards of the projections on the container neck, following which the cap may be unscrewed in the normal way. When the closure is mis-used, the application of excessive unscrewing torque is at first resisted by the angled fin of the invention, which is initially very rigid, but increased torque causes the fin to deform, whereby the outer portion pivots or flexes about the elbow, and this is followed by the cap skirt being forced outwardly to permit the fin to ride over the projection on the container neck. Thus, excessive force (i.e. greatly in excess of the capability of a child or aged infirm person) does have the effect of permitting the cap to be unscrewed from the container, but, in contrast to the known safety closures of this type, the cap is not damaged and can be used again as a safety closure.

Preferably the angle of the fin, i.e. the angle between the radial base portion and the outer portion, is in the range 90-130°, and most suitably it is in the range 100-115°. The fin is preferably so shaped that the base portion at the point where it merges into the skirt of the cap, has a thickness of between 1.5 and 3 times the thickness of the outer portion of the fin.

The invention is applicable to both single-

walled and double-walled types of "squeeze-and-turn" closure. In a single-walled type, both the screw-thread and the internal fin or fins are provided on the single skirt. In the double-walled type, the screw-thread is provided on the inner skirt and the internal fin or fins on the inside of the outer skirt.

Preferably there are two internal fins, diametrically opposed. At right angles to the fins the outer surface of the skirt is suitably provided with a flat, to indicate where squeezing pressure is to be applied.

Additional "safety" may be built into the closure by providing it with a tear-off strip or tear-band at the lower end of the deformable skirt, such that the skirt cannot be deformed until after the tear-band has been removed. Thus, to remove the closure it is first necessary to remove the tear-band, then squeeze the deformable skirt to place the fins and projections clear of each other, and finally unscrew the closure. The tear-band will suitably be joined to the deformable skirt by spaced frangible bridges. In one form the bridges will be positioned axially below the squeeze points of the skirt, with the internal surface of the tear-band being tight up against the cylindrical surface of an annular shoulder formed on the container below the projections. Squeezing of the skirt to deform it is impossible until the tear-band has been removed.

In a second form the internal surface of the tear band is provided with a series of spaced axial ribs, the radially inward surfaces of the ribs being tight up against the annular shoulder on the container to prevent deformation of the skirt on squeezing until after removal of the tear-band. The axial ribs may be joined by an annular web for additional stability.

In another form of the closure the internal surface of the tear-band is provided with inwardly and obliquely directed teeth or ratchets which mesh with corresponding teeth or ratchets formed on an annular shoulder on the container. In this case, even if it is possible to deform the skirt by squeezing, it is not possible to unscrew the closure until after the tear-band has been removed.

In those embodiments of the invention in which the lower end of the deformable skirt is provided with a tear-band it may be of advantage to provide yet further "safety" by the provision of an upstanding annular collar which surrounds the lower portion of the skirt and prevents access to the squeeze points on the skirt. The annular collar may be formed as an extension of the tear-band and may, if desired, be stiffened at least in the region of the squeeze points by buttresses or stiffening ribs. The stiffening ribs on the collar may suitably be formed as extensions of the axial ribs provided on the inside of the tear-band in accordance with the embodiment detailed above.

In a still further embodiment of the invention, a security ring is provided at the lower end of the deformable skirt, and joined thereto by a frangible web or spaced frangible bridges. The inner wall or surface of the security ring is provided with one or more inwardly-directed projections which act against the surface of the container such that when the closure is unscrewed from the container the web or bridges fracture and the security ring remains on the container. The inwardly-directed projections are preferably upwardly-directed spaced arcuate fins which, on unscrewing of the closure, come into contact with an annular shoulder on the container and prevent further upwards movement of the security ring relative to the container neck. In such an embodiment as this, the security ring is preferably attached to the deformable skirt by means of four equi-spaced frangible bridges, suitably positioned at the nodal points of the cap skirt (i.e. those points which do not move out of position when the skirt is deformed). The upwardly- and inwardly-directed fins are preferably four in number, and situated between adjacent pairs of bridges.

These upwardly- and inwardly-directed fins may be moulded in the closure in the attitude which they assume when the closure is attached to the container. Alternatively they may be moulded as inwardly- and downwardly-projecting fins which are then caused to flex and pivot about their junction with the security ring in a post-moulding operation so that they assume an inwardly- and upwardly-directed attitude. This post-moulding operation can be performed as the closure is screwed onto the container.

The accompanying drawings illustrate a number of possible forms of safety closure according to the invention. In the drawings

Figure 1 is a part sectional elevation of a safety closure according to one embodiment;

Figure 2 is a sectional elevation of the closure of Figure 1, showing angled fins on the cap in abutment with projections on the container neck;

Figure 3 is an elevation similar to that of Figure 2, but showing the result of applying excessive unscrewing torque to the cap;

Figure 4 is a sectional elevation of a second embodiment of closure according to the invention, having a tear-band;

Figure 5 is a detail of a further embodiment of Figure 4;

Figure 6 is an elevation, partly in section, of a further embodiment having an alternative form of tear-band;

Figure 7 is a part sectional elevation of a further embodiment of the invention;

Figure 8 is a section on the line VIII-VIII of

Figure 7;

Figure 9 is a part sectional elevation of a further embodiment of the invention; and

Figure 10 is a part sectional elevation of a yet further embodiment of the invention.

The safety closure shown in Figure 1 has a disc-like top 1 from which depends an internal flexible annular sealing plug 2. From the periphery of the disc-like top 1 depends a substantially rigid cylindrical inner wall 3 having a screw-thread 4 for engagement with a complementary thread on the neck of a container to which the cap is applied. A frusto-conical outer wall 5 merges into the cylindrical wall 3 a short distance below the top of the wall 3. The wall 5 tapers in thickness, its thinnest portion being at the point 6 where it merges into the cylindrical wall 3, and its thickest portion being at its outer end 7. The thinning of the wall 5 where it merges into the wall 3 gives the necessary flexibility or deformability to the wall 5.

Formed internally of the wall 5 are fins 8 which engage and co-operate with corresponding abutments or projections on the container neck in the manner disclosed in the prior Specifications referred to above. Thus, as the closure is screwed onto the container neck, the fins 8 ride over and seat behind the corresponding abutments on the neck, so that normal unscrewing removal of the closure is impossible. In order to unscrew the closure, the fins 8 must be placed clear of the abutments, and this is achieved by exerting radial pressure on the wall 5, at the positions of diametrically-opposed flats 9 provided at right angles to the fins 8, and this has the effect of deforming the wall 5, at its lower end, into elliptical form whereby the fins 8 are placed clear of the abutments on the container neck and the closure may then be unscrewed in the normal manner.

Figure 2 shows the form of the fins 8 in more detail. Thus, each fin comprises a relatively thick base portion 80 which extends substantially radially inwards from the skirt 5, an outer portion 81, the end of which is in contact with the abutment 10 on the container neck 11, and an intermediate elbow portion 82. The outer portion 81 makes an angle with the base portion 80 of approximately 115°. When the cap is removed in the normal way, pressure is applied at the flats 9 and the fins 8 are moved radially outwards and clear of the abutments 10. Normal unscrewing can then occur.

The result of the use of excessive unscrewing force, without deforming the skirt 5, is shown in Figure 3. The use of normal force will have no effect, since the fin is initially very rigid. However, when excessive unscrewing force is used the fin 8 deforms and the outer portion 81 pivots about the elbow 82 such that the face of the outer portion 81 previously in contact with the surface of the abutment 10 now faces away from it, the outer portion 81 of the fin rides over the abutment 10, deforming the skirt 5 as it does so, and unscrewing is achieved. It will be appreciated, however, that in contrast to the known closures of the "squeeze-and-turn" type, the fin 8 is not damaged and returns to its initial state once it has ridden over the abutment 10. Further, because of the relative thickness of the base portion 80 of the fin, the stress created by the deformation of the fin is transferred more uniformly into the cap skirt.

Figure 4 shows a closure, similar to that of Figures 1-3, but wherein a tear-band 84 is attached to the lower edge of skirt 5. The tear-band 84 is attached by means of spaced bridges 85, and ratchets 86 on the tear-band 84 co-operate with teeth 87 formed on the container neck. Small bridges 89 at the extremity of each ratchet 86 also attach the tear-band to the skirt 5. The presence of the tear-band 84 represents an additional safety feature. Thus, even though the skirt 5 may be deformed by squeezing at the squeeze points, it will not be possible to remove the cap from the container because of the ratchets 86 on the tear-band 84 engaging the teeth 87 on the container. Before any unscrewing action can occur, it is necessary to remove the tear-band 84, which can be done by grasping the tear-band at its free end 88 and tearing it from the skirt 5. The cap can then be removed in the usual way.

In the embodiment shown in Figure 5, an annular shoulder 12 on the container neck 11 has a cylindrical outer surface 13. A tear-band 14 is attached to the end of skirt 5 through spaced frangible bridges 15. Preferably there is a bridge adjacent each squeeze point (not shown). The inner surface of the band 14 is a tight, or at least snug, fit against the cylindrical surface 13 of the annular shoulder 12. Thus, it is impossible to squeeze the skirt 5 at the squeeze points while the tear-band 14 is attached to the skirt 5. Removal of the tear-band must precede the deformation and subsequent unscrewing of the cap.

In the embodiment of Figure 6, which is similar to that of Figure 4, an annular shoulder 20 beneath the abutments 10 is provided with a set of ratchets 21. Attached to the lower end of skirt 5 is a tear-band 24, the attachment of the tear-band to the skirt being through spaced frangible bridges 25. Provided internally of the tear-band is a series of ratchets 26 which mesh with the ratchets 21 on the container neck, thus preventing unscrewing of the closure until the tear-band 24 has been removed. The ends of the tear-band are joined by a thin link band 27 through a frangible bridge 28. In order to remove the cap shown in Figure 6 action similar to that required for removal of the Figure 4 cap must be taken. Squeezing the cap at the squeeze points

before removal of the tear-band will serve only to increase the engagement of the ratchets 21 and 26.

The embodiment of Figures 7 and 8, and that of Figure 9 are similar to that shown in Figure 5. In the former cases, however, the tear-band 14 is radially spaced from the external cylindrical surface of the shoulder 12, but is provided with spaced axial ribs 30 in the region of the squeeze point 9 (only one set is shown, for convenience). The tear-band is attached to the skirt 5 by bridges 31 adjacent the ribs 30 and by spaced bridges 32 elsewhere. The interior axial surfaces of the ribs 30 are a tight, or at least snug, fit against the external cylindrical face of the shoulder 12. The provision of an integrally-formed arcuate web 33, at least in the region of the ribs 30, helps to ensure that when the closure is squeezed at the squeeze points 9, the abutment of the ribs 30 against the shoulder 12 prevents the skirt 5 from being deformed.

In the form of the invention illustrated in Figure 9, which is otherwise identical to that of Figures 7 and 8, a further safety feature is provided by the upstanding annular collar 40 which surrounds the lower half of skirt 5 and prevents finger access to the squeeze points 9. The collar 40 is an axial extension of tear-band 14 and, in the embodiment shown, is provided with internal strengthening ribs 41 which conveniently are axially aligned with ribs 30.

The example of the invention illustrated in Figure 10 is similar in many respects to that shown in Figure 7, but in the case of the Figure 10 example a security ring 50 is attached to the lower end of skirt 5 by means of four equi-spaced frangible bridges 51, the points of attachment of the bridges 51 to skirt 5 being at the nodal points of the skirt. Integrally moulded to the security ring 50 are four arc-shaped flexible fins 52, equi-spaced around the ring 50 and situated between respective pairs of bridges 51 when the ring 50 is viewed in plan. Fins 52 have their roots at the lower end of ring 50, from where they extend upwardly and inwardly. An annular shoulder 53 is provided on the container beneath the screw-threaded neck 11.

The closure is removed by squeezing the skirt 5 at the squeeze points 9, whereby the fins 8 are placed radially clear of the abutments 10. The closure may then be unscrewed until the free ends of the fins 52 come into contact with the lower face of the shoulder 53. This arrests the upwards movement of security ring 50. Continued unscrewing of the closure stresses the bridges 51 until they break, allowing complete removal of the closure while the ring 50 remains on the container.

The diameter of the circle produced by the upper ends of the fins 52 is preferably slightly larger, e.g. by about 2mms. than the external diameter of the nearest portion 54 of the container, so ensuring that the ring falls down the container and is not retained in its Figure 10 position by frictional engagement with the container.

All the closures illustrated are suitably produced by the injection moulding of a thermoplastics material such as, for example, polypropylene or polystyrene.

Claims

1. A safety closure comprising a cap having a screw-thread for threaded connection with the neck of a container, and at least one internal fin on the skirt of the cap engaging a projection on the container neck when the cap is turned in the unscrewing direction to prevent unscrewing until the skirt of the cap is deformed to place the said fin clear of the said projection, characterised in that the fin has a base portion integrally formed with the skirt and extending substantially radially of the skirt and an outer portion for contact with the projection on the container, the fin being capable of flexing about an elbow intermediate the base and outer portions.

2. A safety closure according to claim 1 wherein the angle formed between the base and outer portions of the fin is in the range 90-135°.

3. A safety closure according to claim 2 wherein the angle formed between the base and outer portions of the fin is in the range 100-115°.

4. A safety closure according to any of claims 1 to 3 wherein the skirt of the cap has two diametrically-opposed internal fins.

5. A safety closure according to any of claims 1 to 4 wherein the screw-thread on the cap is provided on an inner annular wall of the cap and the internal fin or fins is provided on an outer skirt.

6. A safety closure according to any of claims 1 to 5 in which a tear-band is provided at the lower end of the skirt, removal of the tear-band being necessary before the skirt can be deformed.

7. A safety closure according to claim 6 wherein the inside surface of the tear-band comprises a series of spaced axial ribs the radially-inward surfaces of which are a tight fit against an annular shoulder on the container.

8. A safety closure according to claim 7 wherein

the axial ribs are connected by an arcuate membrane.

9. A safety closure according to claim 6 wherein the internal surface of the tear-band is provided with inwardly and obliquely directed teeth or ratchets which mesh with corresponding teeth or ratchets formed on an annular shoulder on the container.

10. A safety closure according to any of claims 1 to 9 wherein the lower portion of the deformable skirt is surrounded by an annular collar.

11. A safety closure according to claim 10 wherein the annular collar is an axial extension of the tear-band of any of claims 6 to 9.

12. A safety closure according to claim 1 wherein a security ring is provided at the lower end of the deformable skirt, and joined thereto by a frangible web or spaced frangible bridges, the inner wall of the security ring being provided with one or more inwardly-directed projections which act against the surface of the container such that when the closure is unscrewed from the container the web or bridges fracture and the security ring remains on the container.

13. A safety closure as claimed in claim 12 wherein the inwardly-directed projections are upwardly- and inwardly-directed spaced fins which act against an annular shoulder on the container.

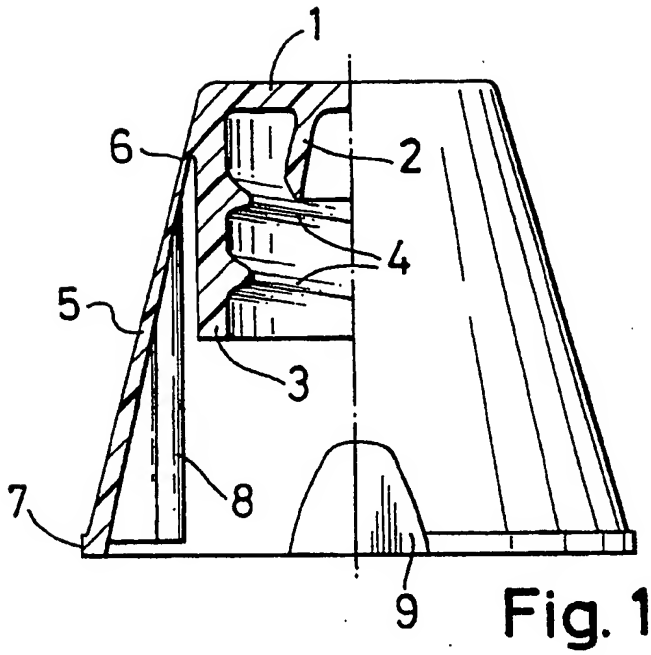


Fig. 1

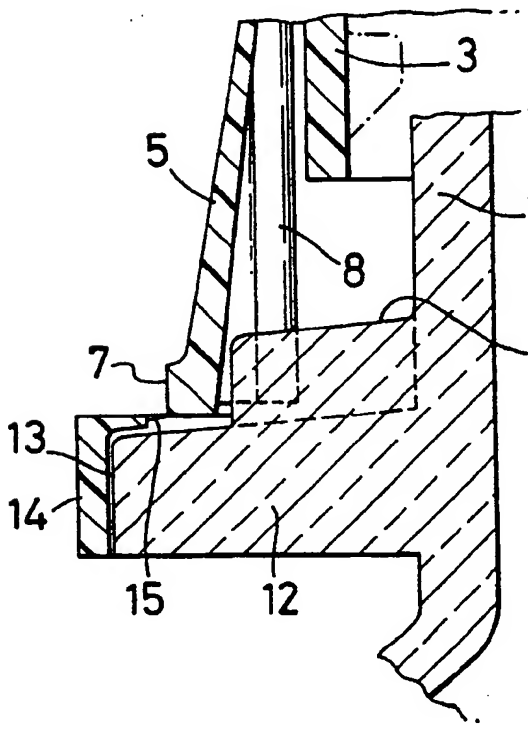


Fig. 5

Fig. 2

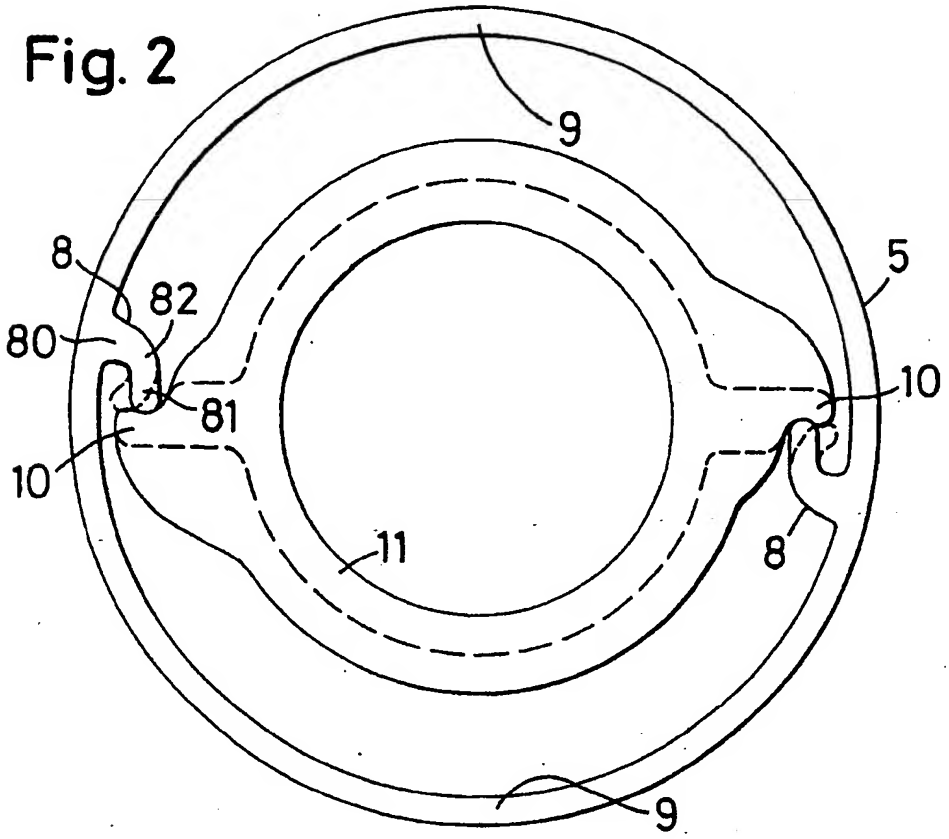
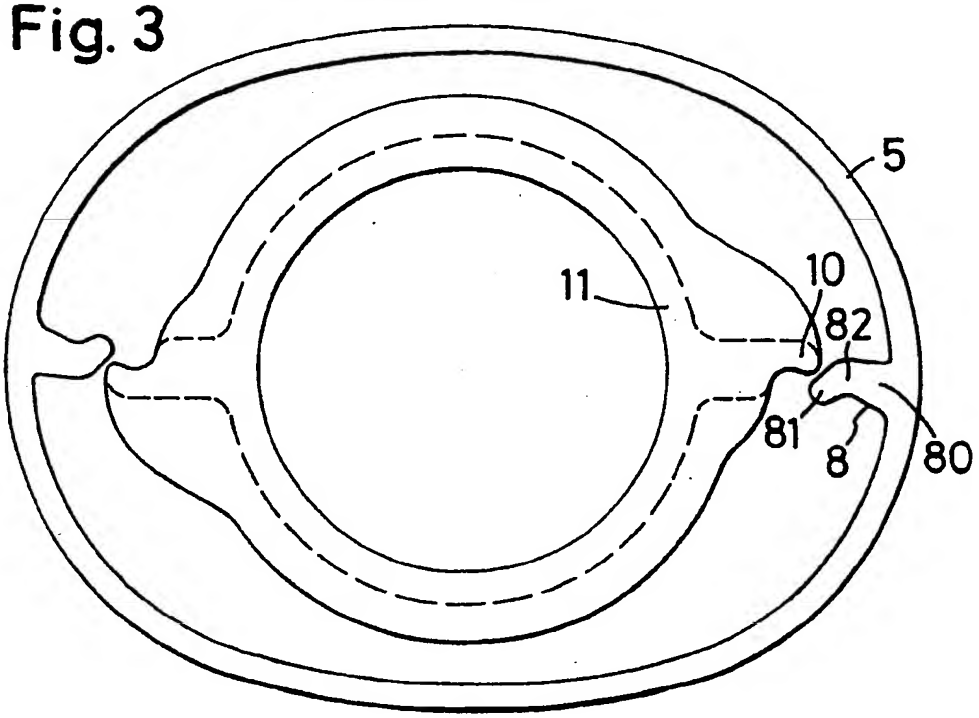


Fig. 3



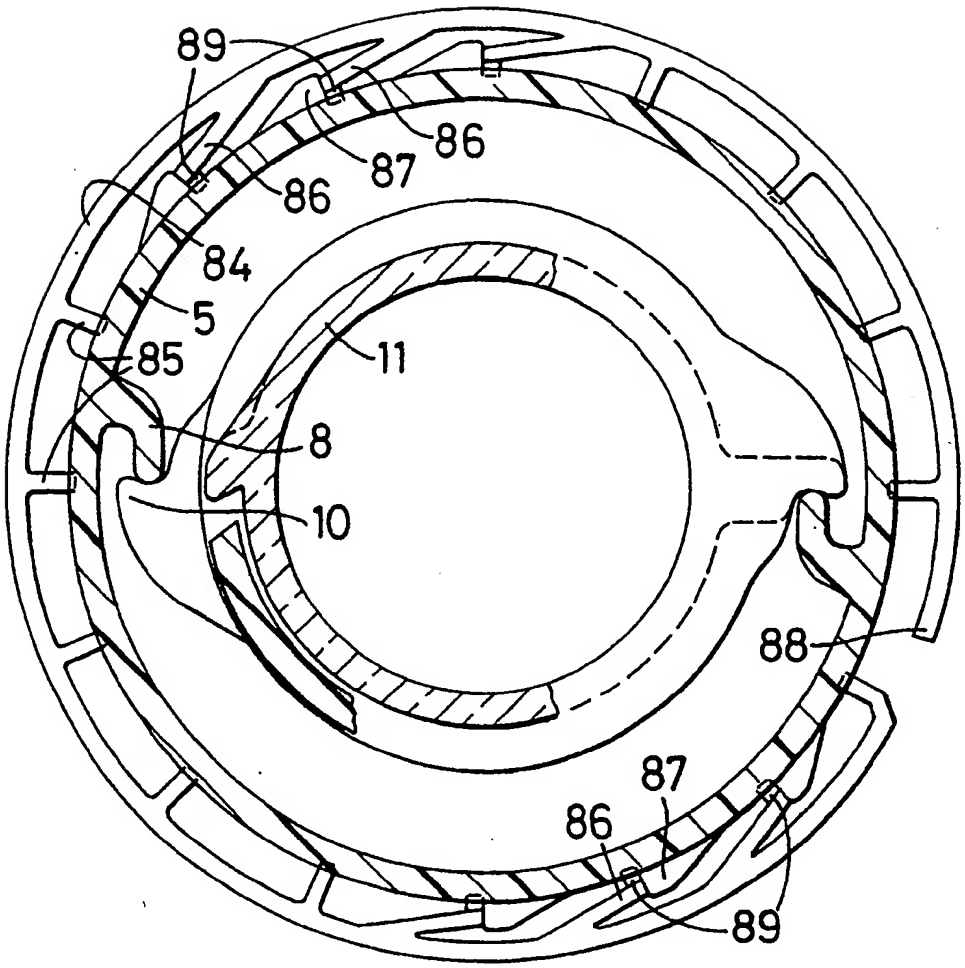


Fig. 4

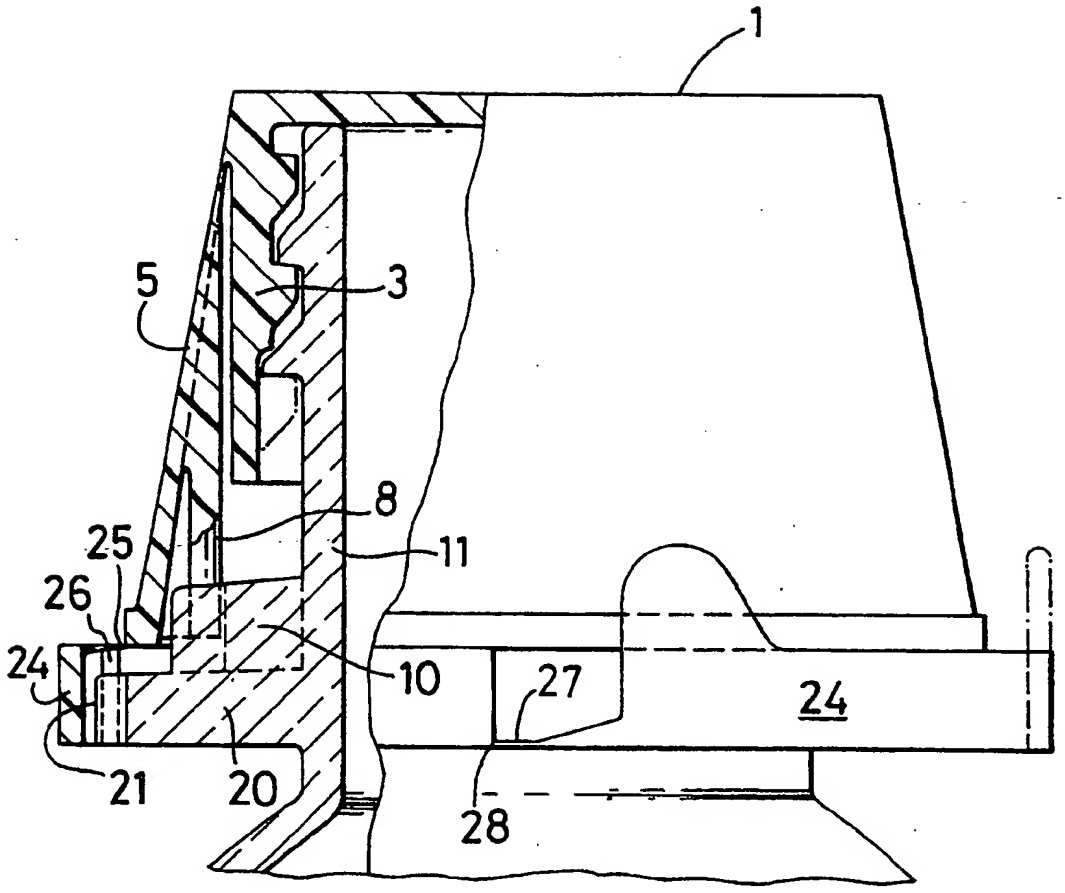


Fig. 6

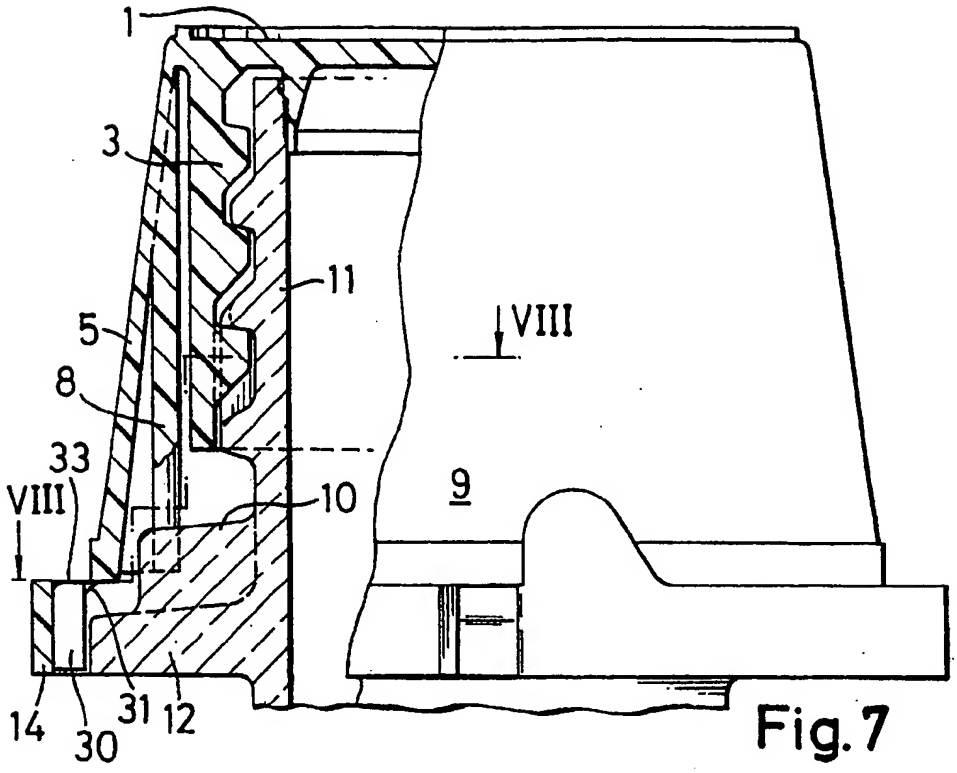


Fig.7

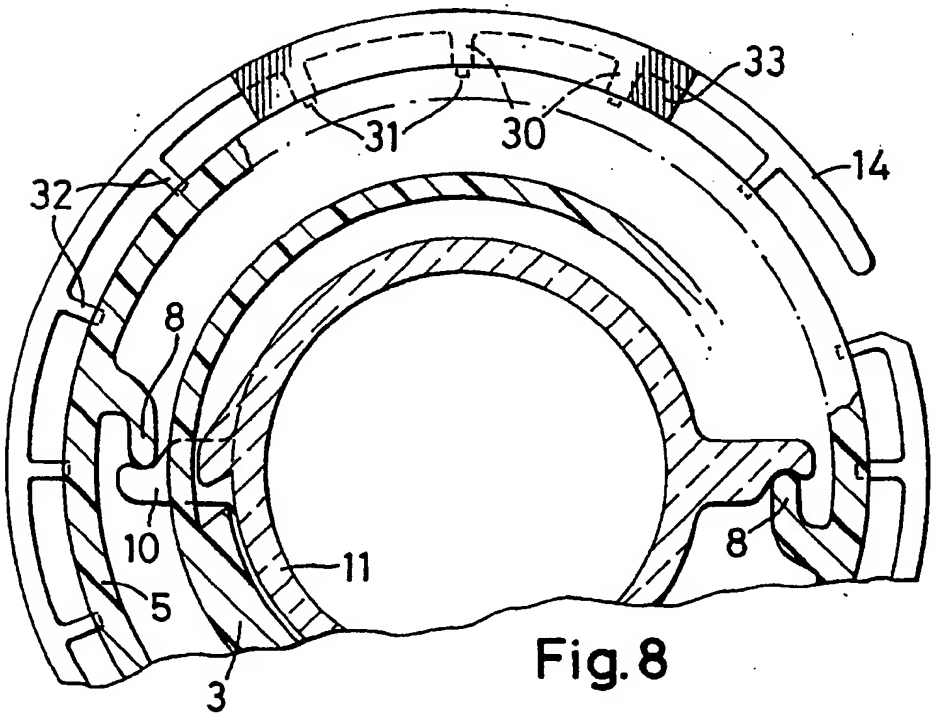


Fig.8

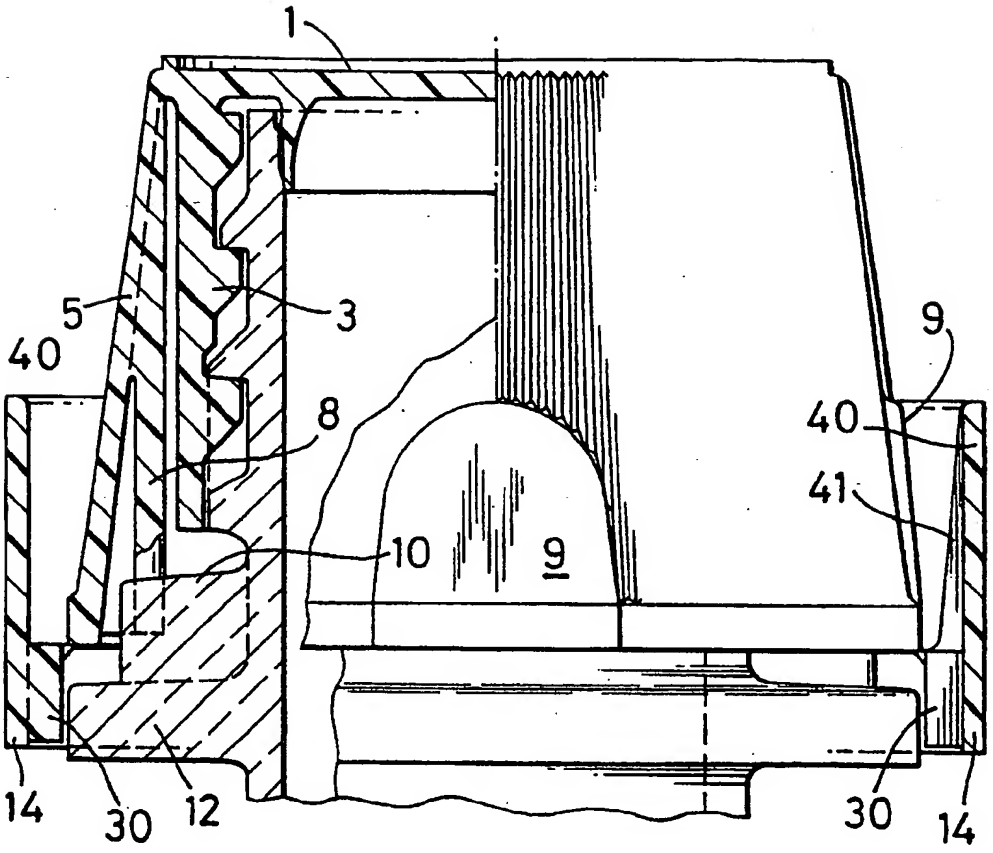


Fig. 9

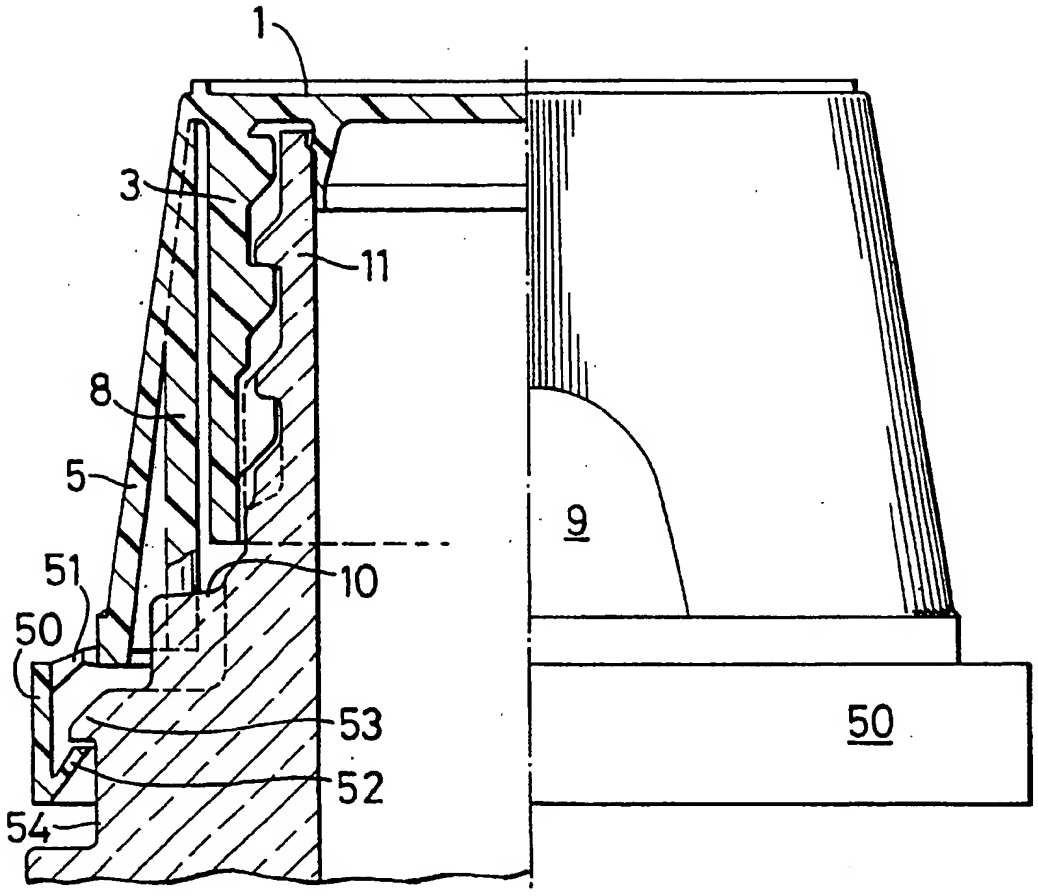


Fig. 10

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 30 1425

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
P,A	WO-A-9 101 924 (E.HOPLY) * the whole document *	1-13	B 65 D 55/02
A	GB-A-2 203 729 (METAL BOX) * abstract * * page 6, line 26 - line 36 *	1	
A	US-A-4 281 771 (C.S.SIEGEL) * abstract *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 D

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	17 May 91	ZANGHI A.

CATEGORY OF CITED DOCUMENTS

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D: document cited in the application
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